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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/653,014	Applicant(s) SHELLEY ET AL.
	Examiner Christopher G. Webb	Art Unit 2878

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-58 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-57 is/are rejected.

7)☒ Claim(s) 58 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 28 August 2003 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 20040920.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

The information disclosure statement filed 9/20/04 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered.

Drawings

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: Element 16 (spec. page 3, line 14). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

Claim 27 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The limitation of the sample including an aluminum alloy as expressed in claim 27 does not further limit its parent claim, claim 26. Claim 26 is dependent on claim 23, which expresses the same limitation.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by Nagarajan et al. (US 2003/0151747A1, hereafter Nagarajan).

With respect to claim 1, Nagarajan discloses a non-destructive method for determining a degree of polish of a metallic substrate comprising: non destructively determining a value I_s (paragraph [0039]) of infrared energy (paragraph [0073]) specularly reflected by the a polished surface on a metal substrate (paragraph [0079]);

and correlating the value of I_s of the infrared energy reflected to a degree of polish (paragraph [0096]).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2-4,16, 19-20, 29, 31-33, and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagarajan as noted with respect to claim 1 above, and further in view of Goetz et al. (US 4,345,840, hereafter Goetz).

With respect to claim 2, Nagarajan does not disclose the method of claim 1 further comprising determining a value I_0 of infrared energy specularly reflected from a reference polished surface. Goetz teaches the step of calibrating a reflectance radiometer with a reference surface. It would have been obvious at the time of invention to one of ordinary skill in the art to combine the step of Goetz with the method of Nagarajan. The use of a reference surface allows for the data collected to be compared to what is known, instead of using the formula for reflectance given by Nagarajan (paragraph [0096]). Avoiding this formula and using a reference will save time and reduce the number of measurements that need to be taken.

As to claim 3, Nagarajan does not teach a comparison of the measured value with the reference value. Goetz teaches the step of adjusting the reflectance

radiometer to read "1.00" on the display during calibration to the reference surface (col. 6, lines 31-33). It would have been obvious at the time of invention to one of ordinary skill in the art to use the step of adjusting the measuring device as taught by Goetz in the method of Nagarajan. After adjusting to the reference surface, any value displayed is measured in comparison to that surface. This comparison of surface reflectivity allows for the elimination of subjectivity by the use of a known reference surface as a starting point for the measurement of numerous other surfaces.

As to claim 4, Nagarajan teaches the use of an infrared spectrometer to determine the intensity of specular reflectance (paragraph [0020]).

As to claim 16, Nagarajan discloses a step wherein determining a value I_s of infrared energy reflected by a polished surface includes reflecting infrared energy off the polished surface at an angle of incidence less than around 45° (paragraph [0097]).

As to claim 19, Nagarajan discloses the determination of the infrared (paragraph [0073]) absorbance (paragraph [0039]) of a sample of a metallic substrate and correlating the infrared absorbance to a degree of polish (paragraph [0096]). Nagarajan does not disclose the step of transmitting an infrared beam onto a sample of a metallic surface and detecting a reflected beam reflected by the sample. Goetz teaches the step of detecting (col. 4, lines 61-66) a reflected infrared beam (col. 4, lines 33-36) reflected by the sample. Also, Goetz teaches that "any radiation source may be used provided only that it includes the narrow bands of interest" (col. 9, lines 6-8). It would have been obvious at the time of invention to one of ordinary skill in the art to include the step of Goetz in the method of Nagarajan. Additionally, it would have been obvious

to include a step of transmitting an infrared beam onto the sample. By including the step of detecting a reflected beam, an experimental value for determining infrared absorbance may be obtained. By including the step of transmitting a beam of infrared energy onto the substrate, the method can be performed almost anywhere, independent of ambient radiation.

As to claim 20, Nagarajan teaches the use of an infrared spectrometer to determine the infrared absorbance (paragraph [0020]).

As to claim 29, Nagarajan discloses a step wherein determining a value I_s of infrared energy reflected by a polished surface includes reflecting infrared energy off the polished surface at an angle of incidence less than around 45° (paragraph [0097]).

As to claim 31, Nagarajan discloses a correlation of a degree of polish to measurements taken from a sample (paragraph [0096]). Nagarajan does not disclose the additional steps listed in claim 31. Goetz discloses the step of detecting (col. 4, lines 61-66) a reflected infrared beam (col. 4, lines 33-36) reflected by a sample of a metallic substrate, determining a first infrared absorbance at a first wavenumber (fig. 1, element I1), determining a second infrared absorbance at a second wavenumber (fig. 1, element I2), and deriving a ratio between the first infrared absorbance and the second infrared absorbance (col. 4, lines 66-67). Goetz also discloses the step of correlating the first ratio to a reference sample in the manner noted above with respect to claim 3. Furthermore, Goetz teaches that "any radiation source may be used provided only that it includes the narrow bands of interest" (col. 9, lines 6-8). It would have been obvious at the time of invention to one of ordinary skill in the art to include the steps of Goetz as

the measurements in the method of Nagarajan. The steps of transmitting an infrared beam onto a surface and measuring the absorbance of the surface by detecting the reflected beam at to wavenumbers, then comparing the ratio to a reference sample would provide a method for measuring reflectivity of a surface that is unaffected by topography and can be performed anywhere, as noted with respect to claims 3 and 19 above.

As to claim 32, Nagarajan does not disclose that the correlation of the first ratio to a reference sample includes comparing the first ratio with a second ratio of infrared absorbance at the two wavenumbers for the reference sample. Goetz discloses a calibration of the reflectometer, which comprises adjusting the ratio of infrared absorbance measured at two wavenumbers for a reference sample to "1.00." With a calibration in this manner, any subsequent measurement taken is compared to the reference reflectivity value. It would have been obvious at the time of invention to one of ordinary skill in the art to use the comparison technique of Goetz as the correlation specified by claim 31. By using a known reference, a standard is devised by which subsequent measurements can be objectively compared.

As to claim 33, Nagarajan teaches the use of an infrared spectrometer to determine at least one of the first infrared absorbance and the second infrared absorbance (paragraph [0020]).

As to claim 38, Nagarajan discloses a step wherein determining a value I_s of infrared energy reflected by a polished surface includes reflecting infrared energy off the polished surface at an angle of incidence less than around 45° (paragraph [0097]).

Claims 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nagarajan in view of Goetz as applied to claim 4 above, and further in view of Mayaji et al. (US 6,074,287, hereafter Mayaji).

As to claim 5, Nagarajan in view of Goetz teaches the use of a spectrometer as noted above with respect to claim 4. Nagarajan in view of Goetz does not teach that the spectrometer is an infrared imaging spectrometer. Mayaji teaches the use of an imaging spectrometer in a polish-measuring apparatus (fig. 9). It would have been obvious at the time of invention to one of ordinary skill in the art to use the imaging spectrometer of Mayaji as the infrared spectrometer of Nagarajan in view of Goetz. The use of an infrared imaging spectrometer would allow for simultaneous recording of different physical locations on the surface being measured, which would ensure an even polish distribution across a surface.

Claims 6-15, 17-18, 21-26, 28, 30, 34-37, and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagarajan in view of Goetz as applied to claims 1 and 19 above, and further in view of Allen et al. (US 2004/0256564, hereafter Allen).

With respect to claim 6, Nagarajan in view of Goetz does not disclose that determining I_s includes determining absorbance at at least one wavenumber corresponding with increased infrared absorbance by an unpolished metallic surface. Allen teaches the choice of a wavenumber that is expected to be absorbed by a

surface. It would have been obvious at the time of invention to one of ordinary skill in the art to apply Allen's wavenumber choice in the method of Nagarajan in view of Goetz. Choosing a wavenumber that is expected to be absorbed by an unpolished metallic surface would allow for comparisons to be made between multiple surfaces.

As to claim 7, Nagarajan does not disclose that the at least one wavenumber is around 3900 cm^{-1}. Goetz teaches the use of a wavenumber around 3900 cm^{-1} (col. 8, lines 14-15). It would have been obvious at the time of invention to one of ordinary skill in the art to specify Goetz choice of a wavenumber around 3900 cm^{-1} as the at least one wavenumber disclosed by Allen. A wavenumber around 3900 cm^{-1} is a preferred choice because it meets Allen's requirement of exhibiting increased infrared absorbance by an unpolished metallic surface.

As to claim 8, Nagarajan does not disclose the step wherein correlating the infrared absorbance to a degree of polish of the sample includes deriving a ratio between the infrared absorbance of the substrate at at least two wavenumbers. Goetz teaches a step of deriving a ratio between the infrared absorbance at two wavenumbers (col. 8, lines 66-67). It would have been obvious at the time of invention to one of ordinary skill in the art to use the ratioing of Goetz in the method of Nagarajan. This band ratioing helps to avoid the effects of topography on the readings (Goetz, col. 2, lines 38-40).

As to claim 9, Nagarajan does not disclose that the at least two wavenumbers are around 3900 cm^{-1} and 900 cm^{-1}. As noted above with respect to claim 7, Goetz teaches the use of a wavenumber around 3900 cm^{-1}. Allen teaches the use of a second

wavenumber around 900 cm^{-1} (paragraph [0022]). It would have been obvious at the time of invention to one of ordinary skill in the art to use the absorbances at the specific wavenumbers given by Goetz and Allen as the infrared absorbance of the substrate at at least two wavenumbers. These wavenumbers are preferred choices because, as noted by Allen, they correspond to ranges in which absorbance would be expected and not expected, respectively, which would facilitate the comparison of two surfaces made from the same material with different finishes.

As to claim 10, Nagarajan in view of Goetz does not disclose correlating the absorbance to a degree of polish of a sample including deriving a difference between the infrared absorbance of the sample at at least two wavenumbers. Allen teaches the determination of a difference between the infrared absorption at a first and second wavenumber (paragraph [0016], lines 24-26). It would have been obvious at the time of invention to one of ordinary skill in the art to combine the determination of Allen with the method of Nagarajan in view of Goetz. The difference between absorbances at the first and second wavenumbers corresponds to the absorbance of the surface (Allen, paragraph [0016], lines 26-29), which in turn corresponds to the surface reflectivity, i.e., the parameter in question.

As to claim 11, the specification of 3900 cm^{-1} and 900 cm^{-1} as the at least two wavenumbers is provided for as noted with respect to claim 9 above.

As to claim 12, Nagarajan in view of Goetz does not disclose that the metallic substrate includes an aluminum alloy. Allen teaches that the metallic substrate includes an aluminum alloy (paragraph [0016], lines 5-8). It would have been obvious at the time

of invention to one of ordinary skill in the art to use the aluminum alloy specified by Allen as the metallic substrate in the method of Nagarajan in view of Goetz. Aluminum alloys are common and widely used. Furthermore, it is common knowledge that varying degrees of polish are desirable for differing applications.

As to claim 13, the determination of I_s includes determining absorbance at at least one wavenumber corresponding with a peak in an absorbance infrared spectrum of an unpolished aluminum surface in the manner noted above with respect to claim 6 above, specifying the metallic surface to be the aluminum surface as noted in claim 12 above.

As to claim 14, the at least one wavenumber is specified as 3900 cm^{-1} as noted above with respect to claim 7.

As to claim 15, Nagarajan does not disclose that the metallic substrate includes a stainless steel alloy. Nagarajan does disclose that the method may be used to determine the specular reflectance of metals (paragraph [0079]). It would have been obvious at the time of invention to one of ordinary skill in the art to include stainless steel as the substrate from which the reflectance will be measured. It is well known in the art that steel is a common metal in industrial applications.

As to claim 17, Nagarajan does not disclose a step wherein determining a value I_s of infrared energy reflected by a polished surface includes reflecting infrared energy off the polished surface at an angle of incidence of around 15°. Allen shows the detection of generally increasing reflectance with a decreasing angle of incidence (fig. 2-5). It would have been obvious at the time of invention to one of ordinary skill in the

art to use the information of Allen with the range specified by Nagarajan as noted above with respect to claim 16 to arrive at an angle of incidence of around 15°. Increased reflectance from the surface would result in a higher power being delivered to the spectrometer, which would in turn provide more accurate readings and lower noise considerations.

As to claim 18, Nagarajan in view of Goetz does not disclose that a degree of polish includes the smoothness of the metallic substrate. Allen teaches that a degree of polish includes the smoothness of the metallic substrate (paragraph [0026], lines 22-23).

With respect to claim 21, Nagarajan in view of Goetz does not disclose that determining I_s includes determining absorbance at at least one wavenumber corresponding with increased infrared absorbance by an unpolished metallic surface. Allen teaches the choice of a wavenumber that is expected to be absorbed by a surface. It would have been obvious at the time of invention to one of ordinary skill in the art to apply Allen's wavenumber choice in the method of Nagarajan in view of Goetz. Choosing a wavenumber that is expected to be absorbed by an unpolished metallic surface would allow for comparisons to be made between multiple surfaces.

As to claim 22, Nagarajan does not disclose that the at least one wavenumber is around 3900 cm^{-1}. Goetz teaches the use of a wavenumber around 3900 cm^{-1} (col. 8, lines 14-15). It would have been obvious at the time of invention to one of ordinary skill in the art to specify Goetz choice of a wavenumber around 3900 cm^{-1} as the at least one wavenumber disclosed by Allen. A wavenumber around 3900 cm^{-1} is a preferred

choice because it meets Allen's requirement of exhibiting increased infrared absorbance by an unpolished metallic surface.

As to claim 23, Nagarajan in view of Goetz does not disclose that the metallic substrate includes an aluminum alloy. Allen teaches that the metallic substrate includes an aluminum alloy (paragraph [0016], lines 5-8). It would have been obvious at the time of invention to one of ordinary skill in the art to use the aluminum alloy specified by Allen as the metallic substrate in the method of Nagarajan in view of Goetz. Aluminum alloys are common and widely used. Furthermore, it is common knowledge that varying degrees of polish are desirable for differing applications.

As to claim 24, the determination of I_s includes determining absorbance at at least one wavenumber corresponding with a peak in an absorbance infrared spectrum of an unpolished aluminum surface in the manner noted above with respect to claim 21 above, specifying the metallic surface to be the aluminum surface as noted in claim 23 above.

As to claim 25, the at least one wavenumber is specified as 3900 cm^{-1} as noted above with respect to claim 22.

As to claim 26, Nagarajan does not disclose the step wherein correlating the infrared absorbance to a degree of polish of the sample includes deriving a ratio between the infrared absorbance of the substrate at at least two wavenumbers. Goetz teaches a step of deriving a ratio between the infrared absorbance at two wavenumbers (col. 8, lines 66-67). It would have been obvious at the time of invention to one of ordinary skill in the art to use the ratioing of Goetz in the method of Nagarajan. This

band ratioing helps to avoid the effects of topography on the readings (Goetz, col. 2, lines 38-40).

As to claim 28, Nagarajan does not disclose that the at least two wavenumbers are around 3900 cm^{-1} and 900 cm^{-1}. As noted above with respect to claim 22, Goetz teaches the use of a wavenumber around 3900 cm^{-1}. Allen teaches the use of a second wavenumber around 900 cm^{-1} (paragraph [0022]). It would have been obvious at the time of invention to one of ordinary skill in the art to use the absorbances at the specific wavenumbers given by Goetz and Allen as the infrared absorbance of the substrate at at least two wavenumbers. These wavenumbers are preferred choices because, as noted by Allen, they correspond to ranges in which absorbance would be expected and not expected, respectively, which would facilitate the comparison of two surfaces made from the same material with different finishes.

As to claim 30, Nagarajan does not disclose a step wherein determining a value I_s of infrared energy reflected by a polished surface includes reflecting infrared energy off the polished surface at an angle of incidence of around 15°. Allen shows the detection of generally increasing reflectance with a decreasing angle of incidence (fig. 2-5). It would have been obvious at the time of invention to one of ordinary skill in the art to use the information of Allen with the range specified by Nagarajan as noted above with respect to claim 29 to arrive at an angle of incidence of around 15°. Increased reflectance from the surface would result in a higher power being delivered to the spectrometer, which would in turn provide more accurate readings and lower noise considerations.

With respect to claim 34, Nagarajan in view of Goetz does not disclose that determining I_s includes determining absorbance at at least one wavenumber corresponding with increased infrared absorbance by an unpolished metallic surface. Allen teaches the choice of a wavenumber that is expected to be absorbed by a surface. It would have been obvious at the time of invention to one of ordinary skill in the art to apply Allen's wavenumber choice in the method of Nagarajan in view of Goetz. Choosing a wavenumber that is expected to be absorbed by an unpolished metallic surface would allow for comparisons to be made between multiple surfaces.

As to claim 35, Nagarajan in view of Goetz does not disclose that the metallic substrate includes an aluminum alloy. Allen teaches that the metallic substrate includes an aluminum alloy (paragraph [0016], lines 5-8). It would have been obvious at the time of invention to one of ordinary skill in the art to use the aluminum alloy specified by Allen as the metallic substrate in the method of Nagarajan in view of Goetz. Aluminum alloys are common and widely used. Furthermore, it is common knowledge that varying degrees of polish are desirable for differing applications.

As to claim 36, the at least one wavenumber is specified as 3900 cm^{-1} as noted above with respect to claim 22.

As to claim 37, Nagarajan does not disclose that the second wavenumber is around 900 cm^{-1}. Allen teaches the use of a second wavenumber around 900 cm^{-1} (paragraph [0022]). It would have been obvious at the time of invention to one of ordinary skill in the art to use the absorbance at the specific wavenumber given by Allen as the second wavenumber. This wavenumber is a preferred choice because, as noted

by Allen, it corresponds to a range in which absorbance would be not expected, which would facilitate the comparison of two surfaces made from the same material with different finishes.

As to claim 39, Nagarajan does not disclose a step wherein determining a value I_s of infrared energy reflected by a polished surface includes reflecting infrared energy off the polished surface at an angle of incidence of around 15°. Allen shows the detection of generally increasing reflectance with a decreasing angle of incidence (fig. 2-5). It would have been obvious at the time of invention to one of ordinary skill in the art to use the information of Allen with the range specified by Nagarajan as noted above with respect to claim 16 to arrive at an angle of incidence of around 15°. Increased reflectance from the surface would result in a higher power being delivered to the spectrometer, which would in turn provide more accurate readings and lower noise considerations.

Claims 40 and 43-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goetz in view of Allen.

With respect to claim 40, Goetz teaches the steps of: detecting (col. 4, lines 61-66) an infrared beam (col. 4, lines 33-36) reflected by a surface and determining a first infrared absorbance at a wavenumber (fig. 1, element I1) around 3900 cm^{-1} (col. 8, lines 14-15). Also, Goetz teaches that "any radiation source may be used provided only that it includes the narrow bands of interest" (col. 9, lines 6-8). Goetz does not teach the transmission of an infrared beam onto the surface. Also, Goetz does not teach that the

surface is an aluminum alloy. Allen teaches a method of measuring reflectivity that comprises measuring the reflectivity of the surface of an aluminum alloy (paragraph [0016], lines 5-8). It would have been obvious at the time of invention to one of ordinary skill in the art to include the step of transmitting a beam of infrared energy onto the surface. It would also have been obvious to specify the surface of Goetz as an aluminum alloy surface. By including the step of transmitting a beam of infrared energy onto the surface, the method can be performed almost anywhere, independent of ambient radiation. It would be obvious to use this method on an aluminum surface because aluminum is a surface that is known to have differing degrees of polish, and determining these degrees of polish objectively would be beneficial to the industry.

As to claim 43, Goetz teaches the step of determining a second infrared absorbance of the surface at a second wavenumber (fig. 1, element I2). Goetz does not disclose that the second wavenumber is around 900 cm^{-1}. Allen teaches the use of a second wavenumber around 900 cm^{-1} (paragraph [0022]). It would have been obvious at the time of invention to one of ordinary skill in the art to use the wavenumber specified by Allen in the method of Goetz. The choice of 900 cm^{-1} is a preferred choice because it corresponds to a wavenumber where absorption for the metallic surfaces is expected to be roughly equal.

As to claim 44, Goetz teaches a step of deriving a ratio between the first infrared absorbance and the second infrared absorbance (col. 8, lines 66-67).

As to claim 45, Goetz does not teach the step of subtracting the second infrared absorbance from the first infrared absorbance. Allen teaches the step of subtracting the

second infrared absorbance from the first infrared absorbance (paragraph [0016], lines 24-26). It would have been obvious at the time of invention to one of ordinary skill in the art to include the step of Allen in the method of Goetz. The difference between absorbances at the first and second wavenumbers corresponds to the absorbance of the surface (Allen, paragraph [0016], lines 26-29), which in turn corresponds to the surface reflectivity, i.e., the parameter in question.

As to claim 46, Goetz does not disclose that transmitting an infrared beam onto the aluminum alloy surface includes transmitting the infrared beam at an angle of incidence less than around 45°. Allen shows the detection of generally increasing reflectance with a decreasing angle of incidence (fig. 2-5). It would have been obvious at the time of invention to one of ordinary skill in the art to use an angle of incidence of less than about 45°. As more acute angles have been shown to correlate with higher surface reflectance, it would be obvious to use an angle of less than about 45° to make sure that the strongest possible signal is delivered to the detection unit.

Claims 41-42 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goetz in view of Allen as applied to claim 40 above, and further in view of Nagarajan.

With respect to claim 41, Goetz in view of Allen does not disclose the step of correlating the first infrared absorbance to a degree of polish. Nagarajan discloses a step of correlating the first infrared absorbance to a degree of polish (paragraph [0096]). It would have been obvious at the time of invention to one of ordinary skill in the art to

combine the step of Nagarajan with the method of Goetz. Correlating the absorbance to a degree of polish is desirable as one may desire to know how polished a surface is, and a degree of polish is a more accessible measurement than the surface absorbance at various wavenumbers.

As to claim 42, Goetz in view of Allen does not disclose that an infrared spectrometer determines the infrared absorbance. Nagarajan teaches the use of an infrared spectrometer to determine the infrared absorbance (paragraph [0020]). It would have been obvious at the time of invention to one of ordinary skill in the art to combine the specification of an infrared spectrometer for determining infrared absorbance with the method of Goetz. The use of an infrared spectrometer for determining infrared absorbance would allow absorbance to be measured with respect to different wavenumbers.

With respect to claim 47, Goetz in view of Allen does not disclose that transmitting an infrared beam onto the aluminum alloy surface includes transmitting the infrared beam at an angle of incidence of around 15°. Nagarajan teaches an angle of incidence between 10° and 70° (paragraph [0097]). As noted with respect to claim 46 above, Allen shows the detection of generally increasing reflectance with a decreasing angle of incidence (fig. 2-5). It would have been obvious at the time of invention to one of ordinary skill in the art to use the information of Allen with the range specified by Nagarajan as noted above with respect to claim 16 to arrive at an angle of incidence of around 15°. Increased reflectance from the surface would result in a higher power

being delivered to the spectrometer, which would in turn provide more accurate readings and lower noise considerations.

Claims 48-50 and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goetz in view of Nagarajan.

With respect to claim 48, Goetz teaches a method comprising: detecting an infrared beam (col. 4, lines 33-36) reflected by a first surface (fig. 1, "reflected radiation from unknown material"), determining a first infrared absorbance of the surface (the step of calibration in col. 7, lines 57-62), detecting a reflected infrared beam (col. 4, lines 33-36) from a second surface (in "field use", col. 7, line 62, understood to mean the method used for "calibration," but performed on a different substrate), determining a second infrared absorbance of the surface (also in "field use"), and comparing the first infrared absorbance to the second infrared absorbance (by values such as those in the tables in col. 5, which are obtained relative to the material used for calibration). Also, Goetz teaches that "any radiation source may be used provided only that it includes the narrow bands of interest" (col. 9, lines 6-8). Goetz does not teach the transmission of an infrared beam onto the surface. Also, Goetz does not teach that the surface is a metallic surface. Nagarajan teaches a method of measuring the reflectivity of a metallic surface (paragraph [0079]). It would have been obvious at the time of invention to one of ordinary skill in the art to include the step of transmitting an infrared beam onto the first and second surfaces, as well as to specify that the surface reflectivity being measured is that of a metallic surface. The steps of transmitting infrared light onto the

first and second surfaces provide a suitable radiation source that could be used without concern for outdoor lighting conditions. The specification of the surface as a metallic surface is preferable because metallic surfaces are known to have varying degrees of polish, and measuring reflectivity is a way to quantify those degrees.

As to claim 49, Goetz in view of Nagarajan does not disclose the step of changing the degree of polish of at least one of the first metallic surface and the second metallic surface. However, it would have been obvious at the time of invention to one of ordinary skill in the art to perform this step. In industrial applications, a specific degree of polish of a surface may be desirable. Therefore, it would be obvious to change the degree of polish of the surface if the measured value does not match the desired value.

As to claim 50, Goetz in view of Nagarajan does not disclose the step of equalizing the first infrared absorbance towards about the second infrared absorbance. However, as noted with respect to claim 49, a specific degree of polish may be desired. Therefore, it would have been obvious at the time of invention to one of ordinary skill in the art to provide a reference surface in place of the second surface and to equalize the first surface towards the second surface. The reference surface provides a known value (much like the step of calibration taught by Goetz in col. 7, lines 57-62), which is the desired result for the first surface. It is unlikely that someone in industry would know a particular absorbance value for a desired degree of polish, but a surface that already has that degree of polish would likely be available. It is a logical step to compare the measurements of the first surface to the measurements of the second surface, and then alter the degree of polish of the first surface until the two are equalized.

As to claim 56, Goetz does not teach that the beam transmission includes transmitting the infrared beam at an angle of incidence less than around 45°. Nagarajan teaches transmission of the infrared beam at an angle of incidence less than around 45° (paragraph [0097]). It would have been obvious at the time of invention to one of ordinary skill in the art to use the angle of incidence specified by Nagarajan for the infrared transmission beam noted above with respect to claim 48. Using such an angle would be beneficial as noted above with respect to claim 17.

Claims 51, 54-55, and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goetz in view of Nagarajan as applied to claim 48 above, and further in view of Allen.

With respect to claim 51, Goetz in view of Nagarajan does not disclose that the first and second metallic surfaces are aluminum alloys. Allen teaches metallic surface including aluminum alloys (paragraph [0016], lines 5-8). It would have been obvious at the time of invention to one of ordinary skill in the art to use the aluminum alloys of Allen as the metallic surfaces of Goetz in view of Nagarajan. Aluminum is a well-known metal and its surface is known to have the ability to be polished to varying degrees. Therefore, it would be obvious to want to measure the degree of polish objectively.

As to claim 54, Goetz in view of Nagarajan does not disclose the step of determining a second infrared absorbance of the surface at a wavenumber of around 900 cm^{-1}. Allen teaches the use of a second wavenumber around 900 cm^{-1} (paragraph [0022]). It would have been obvious at the time of invention to one of ordinary skill in

the art to determine a second absorbance of the surface at around 900 cm^{-1}. This corresponds to a wavenumber where absorbance is expected to be roughly equal for the surfaces with varying degrees of polish as noted above with respect to claim 9.

As to claim 55, Goetz teaches a step of deriving a ratio between the first infrared absorbance and the second infrared absorbance (col. 8, lines 66-67).

As to claim 57, Goetz in view of Nagarajan does not teach the use of an angle of incidence around 15°. Allen shows the detection of generally increasing reflectance with a decreasing angle of incidence (fig. 2-5). It would have been obvious at the time of invention to one of ordinary skill in the art to use the information of Allen with the range specified by Nagarajan as noted above with respect to claim 56 to arrive at an angle of incidence of around 15°. Increased reflectance from the surface would result in a higher power being delivered to the spectrometer, which would in turn provide more accurate readings and lower noise considerations.

Claims 52-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goetz in view of Nagarajan and Allen as applied to claim 51 above, and further in view of Stone et al. (US 5,477,332, hereafter Stone).

With respect to claim 52, Goetz in view of Nagarajan and Allen does not disclose that the first and second surfaces form at least part of the exterior surface of a vehicle. Stone teaches a method to determine the reflectivity (col. 3, line 19) of a metallic surface that is part of a vehicle (col. 14, lines 38-42). Stone does not teach that it is the exterior surface. It would have been obvious at the time of invention to one of ordinary

skill in the art to include the vehicle surface as taught by Stone as the metallic surface of Goetz in view of Nagarajan and Allen. Furthermore, it would be obvious that this surface is an exterior surface. Measuring the surface reflectivity of the exterior of a vehicle is directly applicable to how the vehicle will appear to observers. It is known that often, a more polished surface is preferred over a less polished surface. Furthermore, it is known that a vehicle with an evenly polished surface is more aesthetically pleasing.

As to claim 53, Goetz in view of Nagarajan and Allen does not disclose that the vehicle of claim 52 includes an aircraft. Stone teaches that the vehicle includes an aircraft (col. 15, line 42). It would have been obvious at the time of invention to one of ordinary skill in the art to include an aircraft as the vehicle described by claim 52. Aircraft are often comprised of multiple panels, and, as noted above, an evenly polished surface is more desirable than an unevenly polished surface.

Allowable Subject Matter

Claim 58 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The method of claim 58 was not found in prior art with reference to a part of a building.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 2004/0217290, US 4,284,356A, US 2,215,211, US 2,254,062, US 2005/0006590 A1, and US 6,794,650 B2 disclose relevant prior art.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher G. Webb whose telephone number is (571) 272-8449. The examiner can normally be reached on 9AM - 5:30PM M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David P. Porta can be reached on (571) 272-2444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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